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OUR JOB AHEAD[1]

By Professor RICHARD BRADFIELD

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THERE has been considerable discussion of the advisability of holding our annual meeting this year. Some saw the physical difficulties involved and favored cancellation. The majority, perplexed by the numerous new problems confronting them as a result of the war, felt even more keenly than normally the need to talk over their problems with their colleagues in other institutions. All felt that to justify a meeting at this time especial emphasis should be placed upon problems connected with the war. Such problems have been the dominant theme of our program.

To-night, I shall exercise my prerogative as your President to speak to you about the job that lies ahead of us as agronomists in the post-war world. My remarks are based on the premise that the war will end eventually in a victory for the United Nations. I would not care to think about any other type of post-war world.

I think I can justify speaking about post-war problems in the midst of the war. This is a war of ideals. We need a clear conception of what we are fighting for, if we are to put our best efforts into the war. We need to express our objectives clearly so that the rest of the world can know what they are and can support us if they believe as we do. The problems of the post-war period will be just as difficult, possibly even more difficult, than those of the war. Internal dissension tends to disappear during a war. It will tend to rise again after the tension of war eases and we begin to consider the superficially

[1] Presidential address, American Society of Agronomy, St. Louis, Missouri, November 12, 1942.

less urgent problems of peace. The necessity of war was obvious after Pearl Harbor. The maladjustments of peace may fester for a generation before erupting. We won the last war but lost the peace. We must make this victory complete!

If the victory is to be complete and the peace a lasting peace, it is none too early for all of us to be thinking about it. It is well to have special post-war planning boards to work out details, but in our democracy, the final word is with the people. Our leaders will be helpless unless they have a clear mandate from the people. And finally, if these are not sufficient reasons for speaking about post-war problems in the midst of war, I shall confess that I am, by nature, an idealist, a day dreamer, one of whose joys in life is to plan for a better world.

As agronomists, we all recognize the importance of environment on the course of development of all living organisms. Before considering the problems of the agronomist in the post-war world directly, let us first consider briefly some of the factors in the post-war environment in which he must work. Both the physical and the social-economic-political factors of the post-war environment will be quite different from those of the pre-war world. How different in detail remains to be seen, but certain dominant aspects are clear.

On the physical side, we know that this is a war in which machines have played a more important role than ever before. "Too little and too late" has resulted in defeat after defeat for the United Nations. We have now come to realize that to win this war will require the most Herculean effort ever made by the American people. That "battle of production" is being won.

In his inspiring address before the American Chemical Society in September, Stine[2] pointed out that "the pressures of this war are compressing into the space of months developments that might have taken us a half-century to realize if necessity had not forced the pace.

"Those pressures are unprecedented. The developments are unprecedented. Give us a victorious peace and the freedom of enterprise it should guarantee and our progress will be unprecedented. One does not need to venture into prophecy to sketch the bold lines of what that progress can be. They have already been traced. Already our world of 1940, in which we took such pardonable if mistaken pride, is so distant in the past that it has become an antiquity, as seen through scientific eyes. The inconceivables of two years ago are to-day's realities."

A few specific examples cited by Stine will clarify the picture. The crude rubber production of the world was raised to a million tons a year in the last century. We expect to develop a like capacity for synthetic rubber production in the United States alone in the next two years. In 1943, our production of aluminum will be almost seven times that in 1939, which was over fifty years after Hall's discovery of the electrolytic process for its manufacture. This capacity will be sufficient to build in one year three times the number of passenger cars now operating on all American railroads.

By the end of next year, we shall be producing one hundred times as much magnesium as we produced before the war. In 1915, it was worth $5.00 a pound. To-day, it can be produced for 22½ cents! This makes it even cheaper per cubic foot than aluminum!

We were already referring, before the war, to the years immediately ahead as "the age of plastics." At the end of the war, the newest and most versatile of the plastics will be available on a scale beyond all previous conceptions. Our iron and steel capacity, already ample for all pre-war requirements, is being greatly expanded and will doubtless be more than sufficient to meet all post-war needs. The large scale development of improved alloy steels will be invaluable for many specialized needs.

Synthetic fibers of a great diversity of properties will be available in abundance. The synthetic organic chemist will be prepared to supply scores of new organics at new price lows. Motor fuels that promise to deliver fifty per cent. more power than the present 100 octane grade will be available. There has been a great increase in our capacity to produce electric power. Our machine tool industry has been vastly expanded. We have more men trained to operate them than ever before. In short, we shall have the raw materials, the power, the machines, and the trained men to perform the feats of industrial production of which men have long dreamed. This must suffice for the physical aspects of the picture.

Let us next take a glance at the prospects in the social field. President Roosevelt has said that we are fighting for four freedoms—freedom of speech, freedom of religion, freedom from fear and freedom from want. In the United States, we have all enjoyed the first three of these freedoms as our birthright. But while there has been less want in the United States than in any large country in the world, millions of our people have known want even in the last 25 years. Freedom from want for the common man throughout the world will prove the most difficult of all the freedoms to provide. That freedom can not be won on the battlefield nor at the peace table. Winning the war and writing the peace can set the stage. The widespread approval accorded Vice President Wallace's designation of the century ahead as "The Cen-

[2] Charles M. A. Stine, SCIENCE, 96: 305–11, 1942.

tury of the Common Man" is, I think, an indication that the American people, at any rate, are willing to strive for freedom from want. At the Eighth Scientific Congress in Washington in 1940, Tolley[3] declared that "a central problem of our generation is that of bringing to the people at large the great potential blessings that science has created in the last century." A similar opinion has been expressed by many other qualified scholars.

The satisfactory solution of this problem will require the sympathetic cooperation of all the people. We are learning to pull together during the war; we must continue to do so after the war. None of us should expect to have his wants handed him on a platter. Each must learn to contribute his share to the nation's and to the world's stockpile. There is an unprecedented demand for technically trained men to win the war. They will be needed just as much to win the peace. Scientists must come to grips with the intricate and, as yet, unsolved problems of distribution as well as production. The public must come to realize that, while it may be costly to keep our industrial and agricultural machinery running, it will be costlier still to let it stop! The last Depression is still close enough to serve as a mild warning of what could happen.

In brief, it seems to me that the evidence at hand indicates a widespread approval of the ideals expressed in the Four Freedoms by the leaders and by the people of the United Nations. The most difficult of the freedoms to attain is freedom from want. The social, economic, and political problems involved are intricate and difficult but not hopeless. While physical resources seem ample, many important production problems await solution.

So far, I have attempted to set the stage. Let us now consider the role the American agronomist should play on this new, post-war, world stage. I say world stage advisedly, for I am convinced that the post-war services of American agronomists will not be confined within the United States.

I shall use the term "agronomist" in the same sense that it is used in our society. I conclude from reading our constitution that an agronomist is one interested in increasing and disseminating "knowledge concerning soils and crops and the conditions affecting them."

The primary "wants" of mankind are food and clothing. Both of these are directly or indirectly products of the soil and, hence, of concern to the soil scientist. Both are also dependent, directly or indirectly, largely on field crops and, hence, of interest also to our crops specialists. In broad, general terms, we are largely responsible for the technical developments in the production of mankind's "bread and butter." I shall leave the salad and a part of the dessert to the horticulturists! Because of the very basic nature of our specialty, agronomists and agriculturists, in general, will have unprecedented opportunities to help in shaping the future of society.

Let us first consider briefly our domestic problems. The agronomist's chief responsibility in this connection is to help the farmer develop principles and practices which will enable him: first, to produce enough food, feed, and other crop products of high quality to meet all demands; second, to improve his efficiency of production so that his products can be sold at a fair price and still yield a fair profit; and third, to maintain the productive capacity of his soil. We shall need to consider each of these points in a little more detail.

We are just beginning to emerge from a period in which several important crops, wheat and cotton in particular, were produced in much larger quantities than we were able to consume or sell at profitable prices. The demands of the Lend-Lease program are gradually reducing the surpluses of most commodities, and rationing of other products is already under way. There seems to be little question of our ability to produce in this country adequate amounts of all of the principal crops suited to our diverse climate. There is evidence of need of some adjustment in the types of crops produced in order to bring the supplies more in line with the requirements of an adequate diet for our entire population. Considerable attention is being given to the possibilities of industrial utilization of agricultural waste products and surpluses. There will doubtless be some progress in that direction. Agriculturists should keep in mind, however, that the modern industrial chemist can destroy markets for agricultural products as well as create them. Just imagine that you owned a rubber plantation in the East Indies, and I think you will see what I mean!

Before the war, our export market for most agricultural products had sunk to an all-time low. There seems to be little evidence to indicate that it can be regained in a world at peace. I see little reason to doubt that we can produce in this country all the agricultural products that we can consume or that we can hope to sell.

This does not mean that our job is done. It merely indicates that our major peace-time problem is not that of increasing our volume of production. Much can be done to increase the diversity and to improve the quality, particularly the nutritional quality, of our foods and feeds. Our people are more interested in adequate nutrition than ever before. The high nutritional standards in our armed forces will doubtless do

[3] H. R. Tolley, *Proc. of 8th Am. Sci. Congress*, Vol. 5, p. 279. 1940.

much to improve the food habits of the men when they return to their homes. Better tools for assaying the nutritional value of foods have been developed and are rapidly being improved and simplified. We know but little about the effect of various environmental factors upon these different quality factors in foods and feeds. Different genetic strains of crops differ widely in the content and nature of their vitamins, fats, proteins, and carbohydrates. They offer the plant breeder an almost virgin field in which to exercise his talents. In the future, yields of dry matter and protein content will not be accepted as adequate criteria for judging the relative value of any given agronomic treatment or of a new variety or strain.

I have often been impressed by the wide range in the production cost figures obtained by farm management specialists for different farmers in the same community. Some of our New York farmers can produce 100 pounds of milk for half what it costs their neighbors. Even in the midst of the depression, a few farmers managed to make a little money. Increased efficiency of production of crops is a goal that the agronomist should keep constantly before him. I can think of no circumstances under which the farmer is liable to suffer because his production costs are too low. Economical production is sound in peace or war, in prosperity or depression. In the competition for a market, everything else being equal, the most efficient producer will win out whether the competition is between neighbors, between regions, between products, or between a domestic and a foreign producer. Artificial subsidies and barriers may bolster the inefficient producer temporarily, but it is futile to rely upon them as a permanent policy.

When I try to analyze in detail the various steps involved in crop production, there does not seem to me to be a single step that we can sort out and say, "This step is perfect. Nothing can be done to improve it." Processes which we may regard as satisfactory to-day may be challenged to-morrow in light of new information. I was taught that one of the important objects of plowing was to cover crop residues. Now, many agronomists are trying to find out how to plow without covering the "trash." Much of our farm machinery is in the same stage of development as the early automobiles with a dashboard and whip socket. Machines designed 50 years or more ago for operation with horses have been slightly altered to adopt them for use with the tractor. We need to make a thorough study of all the operations required in growing a crop from seedbed preparation to harvest, and after we have decided what operations are necessary for the most efficient production, we should solicit the assistance of the agricultural engineer and the farm machinery manufacturer for designing and making the implements required. They can not do their job until we have done ours. A few years ago, we were dissatisfied with the fertilizer distributors on the market. A complaint was made to the agricultural engineers. They asked us where we wanted the fertilizer placed with respect to the seed. We had to admit that we did not know but agreed to find out. Our joint committee on Fertilizer Application was set up. Cooperative experiments involving many crops, many soils, and many climatic conditions were carried out. Within a couple of years, the engineers were given their answer, and the next year, improved fertilizer distributors were available. Many farm machinery manufacturers are now using their factories for making war machines. The time would seem propitious for getting the basic information necessary for the intelligent redesigning of farm machinery. Far-sighted leaders in the field are already at work on the problem and, I am sure, would welcome the suggestions of agronomists.

The most important factor affecting crop yields in this country is still the weather. It is far more effective than any legislative control program. Many prospective agronomists are now studying meteorology in connection with the air service. They may be able to do something with the weather when the war is over. Even if they fail us, and the post-war weather remains uncontrollable, I feel that the agronomist should be able to help the farmer become more independent of the vagaries of the weather. There was a heavy hay crop in much of eastern United States this year. But the heavy rainfall, responsible in a large measure for the heavy hay crop, continued during hay harvest. As a result, much of the hay rotted in the field and much of that saved was seriously damaged by the rain. Shall we always be so helpless? Shall we always, under such circumstances, have to risk the loss of a crop which requires a whole season to grow just because we do not get an additional eight to fifteen hours of sunshine at harvest time?

Several possible solutions are being studied, grass silage, artificial drying, and barn curing; all these seem worthy of further investigation and of more widespread farm trials.

As a direct result of the war, the capacity of our synthetic ammonia plants has been enormously increased. There seems little question but that after the war there will be available for use as fertilizer at least twice as much nitrogen as we have ever used and at a price much less than we have ever paid. A national joint committee, made up of representatives of several interested organizations, has been set up to consider the possible agricultural uses of this material.

Many of you participated in this conference held in connection with this meeting. The possible industrial and agricultural implications of this development are considered by some industrial leaders large enough to have an effect on our post-war economy, "comparable to the discovery of a sixth continent."

When we consider what most of our pastures are and contrast that with what they could be, when we think of how the lespedeza rotations have affected the agriculture of Missouri and neighboring states in the last few years, when we think of what hybrid corn has done for the corn belt in the last decade, when we consider what a small percentage of the plants in the world we have tried seriously to introduce into our agriculture, I'm sure we would all agree that there is still much the agronomist can do to help the American farmer increase his efficiency of production.

I am also convinced that American agronomists have a very important international service to perform. The world seems much smaller than it did two years ago and many of its distant lands much closer to us. When the war is over, there will be millions to feed, large communities of people to be resettled, and farms to be supplied with seed, fertilizer, machinery, and livestock. A roster of qualified personnel for assisting with such work is already being prepared.

In addition to these emergency problems at the close of the war, there will be a need for American agronomists to help many countries with a primitive agriculture and, in many cases, a population larger than it can support at a satisfactory level. After long experience in public health work in such countries, the leaders of some of our large philanthropic foundations have become convinced that the best way to improve the health and general well-being of such people is to first improve their agriculture.

A high proportion of the world's farm population is still using techniques that were in use in Biblical times. Contrast the human effort that goes into the production of a bushel of wheat on one of these primitive farms with that in our wheat belt. To prepare the seedbed, the soil is "tickled" three or four times with a wooden plow drawn by a pair of oxen, the seed is broadcast by hand, the wheat is harvested by cutting one handful at a time with a sickle, it is then carried or hauled to the threshing floor, often the bare ground in an open field, where it is threshed with a flail or by treading with animals! Think of doing all this work for an average yield of eight bushels of wheat per acre! Yet wheat is being grown in this way by thousands of farmers within one day's flying time from here!

American agronomists can be of great service to the governments and educational institutions of such countries. The movement was spreading before the outbreak of the war. It will be resumed at accelerated speed after the war. Foreign students, in increasing numbers, will come to our shores for special training. Scholars from all countries should be made welcome. I hope our price level can be kept in close adjustment with that in other countries so that travel and study in America will not be beyond the reach of the ambitious young people in other countries. I would like to see our American universities far outrival the German universities of half a century ago in their influence upon science and upon the thinking of the world.

And why not? We have or can have the same academic freedom of which they were once so proud. We have or can have an equal quality of intellectual leadership. We have or can have physical facilities for research which will be unsurpassed in any country. I would have the scholars of the world love America. I would have them go back to their countries and instil some of that love of America in their students and other countrymen. Such friends would be America's strongest armor, her best insurance for a lasting peace. Can you conceive of any investment that would yield greater returns to America in the way of international understanding and good will than the education of a Madame Chiang Kai-Shek?

The soil scientists of America had made a good start toward better relations with their colleagues in other countries, even before the war. Their International Congress, held in Washington in 1927, and the excursion throughout the United States which followed, gave many foreign scientists their first opportunity to study our soils and to become acquainted with us. The Second Congress in Russia in 1930 stands out in the memories of many of us as one of the outstanding treats of our professional careers. The seeds of the present conflict had been sown before our Third Congress at Oxford in 1935. An undercurrent of rumors and distrust was apparent to all. At the meeting of the Soil Microbiology Commission in New Brunswick, New Jersey, in August, 1939, a cordial invitation to participate in the Fourth International Congress to be held in Germany in 1940 was presented. The German Organizing Committee had, even at that time, planned with characteristic thoroughness every detail of the Congress and of the excursion to follow. A few days later, war was declared, and a few weeks later, the Congress was postponed. Many of the pioneers in this society will be missing when the war is over. New leaders must be found to take on the responsibility for its revival after the war. The job will require men of great tact and understanding.

It seems to me to be especially important for us to develop a better acquaintance and understanding with

our colleagues in Latin America. A start was made at the Scientific Congress in Washington in 1940 and at the Agricultural Conference in Mexico City this summer. These conferences should be followed up with a democratic organization of the agronomists of these countries.

There is in my mind no question about the enlarged opportunities for service and the responsibilities for leadership at home and abroad that will be within the grasp of American agronomists at the end of the war. The next question is: "Do we have the men to do the job?" A decade ago, the market for young agronomists seemed to be about saturated. Able young men, well trained, equipped after years of sacrifice with a Ph.D. degree, were doing odd jobs until a real job in their field was open. A little later, the Soil Conservation Service was established. Within a short time, it had a budget greater than the soils divisions of all other state and federal organizations combined, and it was scouring the country for men with some agronomic training. The demand for well-trained men continued keenly up until the outbreak of war. Now nearly every institution or organization employing agronomists has several vacancies on its staff. Many of us are gradually becoming reconciled to the idea that many of the vacancies will have to remain unfilled until the war is won. Some of us can get a little relief by hiring men away from other institutions, but such tactics will not help the over-all shortage and should probably be confined to the normal traffic.

The graduate student enrollment in most institutions is only a small fraction of normal. It will doubtless tend to get lower as long as the war continues. At the close of the war, many of those who were planning a career in some field of agronomy will return to our graduate schools. Many who have accepted "temporary" positions in defense industries will tend to lose touch with developments in agronomy and will probably remain in industrial work. In view of these facts, I am inclined to think that the demand for able, well-trained agronomists will exceed the supply for at least ten years after the war is over. The only thing that I can think of which would "glut" the market would be a very drastic reduction in the support given some of our federal agencies or state institutions.

Let us consider a little further the potential post-war demand for agronomists. There are never enough "top notch" men to satisfy the demand. The demand will be keener than ever after the war. We shall need a few dreamers, far-sighted men, who can see the paths we should take and lead us and the country at large to see the potentialities for mankind that lie hidden in our soils and crops. We are, as a whole, a rather practical group, tied rather closely to the conventional approaches to our problems. For those of us who have to deal daily with farmers and their practical problems of the moment, this is highly desirable. But if we are to break new trails, we shall need a few visionary men, men broadly trained not only in the basic sciences, but in the humanities as well.

A few days ago, I heard a nationally known farm leader say that he was going to resign from several important positions so that he could have time to think about some of these problems that are going to confront agriculture after the war. In his address to chemists referred to above, Stine said, "We are going to need to be visionary to the point of audacity." If agriculture is to keep pace with industry, agriculturists must be equally bold and farsighted.

I anticipate but a modest expansion in the number of agronomists on our college, university, and experiment station staffs. I will not even risk a guess about the future for agronomists in the United States Department of Agriculture. There is, however, another broad and practically virgin field in which the professional agronomist could render valuable service. I am convinced that a half-dozen or so extension agronomists will not be able to meet the demands for help from farmers of a large state which will arise after the war. There should be at least one professional agronomist available for consultation in every important agricultural county. In some counties, the county agent himself is qualified to handle the agronomic problems which come up in his county. More commonly, his own training is too limited, and the demands on his time are too numerous to enable him to do the work satisfactorily. These county extension agronomists would not necessarily have a Ph.D. degree. They should have a good farm background, a strong undergraduate major in agronomy, topped by one or two years post-graduate work in soils science, especially soil management, field crop production, farm management, and allied fields. They should be able to handle most of the individual farmers' problems. They would have the responsibility for supervising all agronomy demonstrations in their counties. Only the more difficult situations would be referred to the state extension specialist. The latter would function more largely through the county agronomy specialists in his region and through group meetings of farmers. Plans somewhat similar to this are already in operation in sections of the country. In areas where large farming corporations are operating, such organizations could well afford to have a professional agronomist on their staffs. I understand that the sugar planters of Hawaii have established systems of agronomic management and control much more elabo-

rate than I have outlined here, and they have found that it pays. Estates as small as 1000 pectares in East Prussia frequently have university trained specialists in agronomy and animal husbandry on their staffs. Our agriculture consists, and will probably continue to consist, largely of relatively small, individually owned and operated farms. Some expansion of the already firmly established county agent's staff would seem the most efficient way of providing this added professional service where it is needed.

I cannot refrain at this point from commenting briefly on the organization of agronomic work in this country. The great bulk of our research and teaching in agronomy is supported by public funds. The great majority of the members of our society are employed by county, state, or federal agencies. As public servants, there are two different points of view as to how we should conduct ourselves:

The first is that we should confine our activities strictly to our field of specialization. In other words, "stick to our last."

The other is that we, as specialists in the public service, have a certain definite responsibility for helping to develop public policy in the field of our specialization. Agronomists are still citizens and, as such, cannot escape the responsibilities of citizenship.

I feel that one of the most outstanding public services ever performed by an American soil scientist has been performed by Dr. H. H. Bennett. As a result of years of experience in studying soils, especially those of the south, he was convinced that something more had to be done to stop erosion, or the agriculture of large sections of our country would be seriously impaired. In just about a decade, he has succeeded in persuading Congress that something should be done about it, and he has made the country erosion-conscious. The nation unquestionably owes him a debt of gratitude. We need more men with his vision.

We have recently had numerous new agencies set up in the United States Department of Agriculture—many of them largely as emergency measures and presumably of temporary duration. As originally conceived, each had a rather distinct function to perform, a function which no existing organization was adequately handling. Being liberally supplied with funds, these organizations expanded rapidly. Many of them soon extended into every section of the country. Each is tending to become a Department of Agriculture within a Department of Agriculture. The result has been confusion, working at cross purposes, and friction. A very considerable proportion of the time of some of our ablest men in the agronomic field is spent in trying to iron out difficulties which should never arise. I am convinced that no intelligent man could study the existing organization of the work being done in this country in the broad field of soil science and field crop production and justify it. Agronomists in these various agencies are earnest and sincerely anxious to do their work well. I have no solution to offer. But I am sure that none of you, especially those of you with administrative responsibilities, could ponder over "our job ahead" without having this problem of the organization of our work appear as a very vital part of the task.

A few months ago, I wrote a friend in Germany, a soil scientist who has traveled in this country and is well known to many of you, that with our traditions of democratic freedom in America, we found it difficult to understand how the intelligent German people could submit to the tyrannies of Hitler. His reply was that with our bountiful resources in America we might be able to afford liberty and democracy but that Germany is a much poorer country and must be more efficiently organized to survive! I have thought of this letter many times since the outbreak of war. Is it necessary to sacrifice efficiency in order to maintain our democratic freedom? We will all have to admit that, at times, things seem to move much more slowly in a democracy. We do more cutting and trying, more experimenting, and more compromising. We give more weight to the views of minorities. This retards action, but I think we will all agree that it increases the probability that we shall come out with the right answer in the end. Let us hope that this applies to the organization of our agronomic work. Let us hope that the present confusion represents, from the long-time point of view, merely a transitory experimental stage which will lead soon to the development of an efficient, well-integrated program. Such a development is necessary if we are to fully discharge our duties to the public. It is necessary if our services are to be more effective in helping post-war agriculture vie with post-war industry in supplying the wants of mankind.

OBITUARY

GEORGE WASHINGTON CRILE

DR. CRILE was born in Chili, Ohio, on November 11, 1864, and died in Cleveland on January 7, 1943. He received his A.B. degree at Ohio Northern University in 1884 and his M.A. and M.D. degrees at the University of Wooster, 1887.

Dr. Crile served his alma mater as lecturer and professor of physiology and also as professor of clinical

surgery. In 1900 he was appointed professor of clinical surgery in Western Reserve University and became professor of surgery in 1911. In 1924 he retired in order to give his entire time to the Cleveland Clinic, of which he was a cofounder in 1921. After this clinic was fully established he devoted most of his time to travel and more general biological studies.

For Dr. Crile the road to surgery was through physiology—an association closely linked with his earlier teaching of this science. Also in those early years his extensive experience in traumatic surgery greatly stimulated his interest in the problem of surgical shock. No surgeon probably has had a keener and quicker appreciation of surgical risk, of how to handle living tissues and of the practical means for conserving the patient's natural resistance. To these ends through a very busy professional life of over 50 years he utilized to the utmost his unusual speed in operating, manual dexterity and technical training. Dr. Crile combined an unusual capacity for sustained mental and physical work requiring the highest skill with personal charm and leadership. Endowed with a physique far above the average he conserved this endowment to the utmost only to expend it lavishly for the advancement of his professional work. A typical day began at 8 A.M. with 6 or 8 major operations lasting until noon. He then spent an hour or more with his staff and visitors in his personally financed research laboratory. After lunch he handled his correspondence, went over research projects and data and took care of a busy consultation practice.

Dr. Crile was actively engaged in investigative work throughout his long surgical career. Early identified with the physiological problem of surgical shock for which he received the Cartwright prize in 1897, the Nicholas Senn prize in 1898 and the Alvarengo prize in 1901, he has made noteworthy contributions to its nature and to the methods for its prevention and relief. He was perhaps the first to make a direct transfusion of blood (1905) as a means of combatting this serious complication of physical and psychic trauma. Much of his experimental and clinical research in this field is to be found in his books on "Blood Pressure in Surgery" (1903), "Hemorrhage and Transfusion" (1909), "Anaemia and Resuscitation" (1914) and "Anociassociation" (with W. E. Lower, 1914).

His active and unusual mind gradually took him into more general fields of biological investigation and away from the strictly surgical problems of earlier years. Such monographs as "The Kinetic Drive" (1916) (Wesley M. Carpenter lecture), "A Bipolar Theory of Living Processes" (1926) and "The Phenomenon of Life, a Radio-Electric Interpretation" (1936) illustrate this phase of his activity and also aroused some criticism.

Dr. Crile was a member of many foreign and domestic medical societies, including those of the basic sciences, clinical medicine and surgery. He was an unusually regular attendant at most of the meetings of these societies and generally contributed papers or participated in discussions. He was a prolific contributor to medical journals and in addition published more than 25 monographs, including "Man, An Adaptive Mechanism" (1916), "Diseases Peculiar to Civilized Man," "A Mechanistic View of War and Peace" (1915) and "Intelligence, Power and Personality" (1941).

Many honors came to him. Honorary degrees were conferred by Hiram College, the University of Wooster and by the Universities of Dublin and Glasgow. He was president of the American College of Surgeons, a charter member of the Board of Regents and its chairman since 1917. He was a member of the founders group of the American Board of Surgery and in 1923 was president of the American Surgical Association.

Dr. Crile was the recipient of many medals, including American Medicine (1914), The National Institute of Social Sciences, the Trimble Lecturer medal, the Lannelongue International Medal of Surgery, the Cleveland Medal for Public Service and the Distinguished Service Gold Key of the American Congress of Physical Therapy.

In 1898 he was Brigade Surgeon in the Volunteers with the rank of Major and served in Cuba and Puerto Rico. In 1917 he organized and was professional director of U. S. Army Base Hospital No. 4 stationed in France. He was promoted to Colonel in 1918 and in 1921 to Brigadier General in the Medical Officers Reserve Corps. He was awarded the Distinguished Service Medal in 1919, became an honorary member of the military division, 3rd class, Commander of Bath, and in 1922 was made a Chevalier in the French Legion of Honor.

Dr. Crile married Grace McBride of Cleveland in 1900, who ably contributed to his career.

DAVID MARINE

MONTEFIORE HOSPITAL,
NEW YORK, N. Y.

HARVEY LEROY WESTOVER

HARVEY LEROY WESTOVER, in charge of the Alfalfa Project in the Division of Forage Crops and Diseases, Bureau of Plant Industry, Agricultural Research Administration, U. S. Department of Agriculture, died in Washington, D. C., on January 2, of a heart complication. He was born in Austerlitz, N. Y., on June 4, 1879, the son of Seymour and Anna Gott Westover. He took his college work at Cornell, where he received his B.S. in 1906. He came to the U. S. D. A. that same year to the Office of Soil Survey, where he spent five years, then after devoting two additional years to

classifying soils for the Forestry Division he came to Forage Crops, as it was then called, in 1913. The division had been created in 1905 with a broad and important research program. The study of alfalfa was one of the principal lines of work and by 1913 it had progressed far enough to reveal its immense potentialities. The newcomer to the ranks was therefore assigned to the study of alfalfa—a study he was to follow with notable results until the time of his death. He and his crop grew in stature together. He worked in field and laboratory, he learned from books and from farmers in every section of the country where alfalfa is grown, he traveled across the world looking for better alfalfa, hardier alfalfa, disease-resistant alfalfa. He went to Argentina and Chile in 1924, to Russian Turkestan and Continental Europe in 1929, to Spain and North Africa in 1930, to Russian Turkestan and Turkey in 1934, and to Turkey in 1936. His persistent, systematic work, his faith and his loyalty were richly rewarded in his growth and the growth of the plant he studied. As years passed and the country grew and developed, deep, rich, green fields of alfalfa spread across the Northern Great Plains giving enormous and seldom-failing yields of hay and seed.

In the history of the world 1915 marks an epoch. World War I disturbed the established order of things and focused the attention of the farmer and scientist as well on the need for food crops. As a good deal of alfalfa improvement work had been done with emphasis on the factor of winter hardiness, and a group of superior varieties and strains had been developed, growers of the crop and breeders too turned their attention and talents elsewhere. Plants like humans suffer strange ills under crowded conditions and the fine fields of full-yielding alfalfa began to wither and die and no one knew why. The Department of Agriculture investigated and found that the disease was produced by a hitherto unknown bacterium that caused a malady they called bacterial wilt. Now that a diagnosis had been made the next and most important step was to find a remedy. The logical recourse seemed to be a breeding program. Westover set out and traveled the remote quarters of the globe gathering alfalfa in almost every country, seeking new varieties and strains that might prove resistant and save the enormous losses that were being sustained and that would eventually destroy the crop in certain localities. From Russia, from Turkestan, from Morocco, from Spain and from Continental Europe he brought seeds and plants and more seeds and plants until his collection grew to over a thousand different strains being grown with hope and skill in nurseries all over the United States.

In 1933 the Alfalfa Improvement Conference was created by scientists from all parts of the United States and Canada and logically Mr. Westover was elected the Permanent Secretary of the Executive Committee. In experiment stations all over the country the work progressed, the interest grew, hope was kindled and strangely coincidental is the fact that on the very day Harvey Westover closed his desk for the last time he had dictated the release of a new variety which had been called Ranger. Ranger is a composite of seed collected from various explorations, brought together, developed and tested at the Nebraska Agricultural Experiment Station and elsewhere. It promises to be what he set out to find—an alfalfa that can withstand bacterial wilt.

As Mr. Westover traveled over the world collecting alfalfa, he collected other seeds and plants along his way. Great packing boxes of these he sent back to the Department and these too are being carefully and hopefully studied and developed. He published many bulletins and scientific papers, not only on his major interest, but on other studies that he carried on in addition—silage, crested wheatgrass, root crops, lawns and fine turf particularly. During 1926–1929 he served as the acting chairman of the Greens Section Committee of the United States Golf Association. He was a fellow of the American Society of Agronomy and of the American Association for the Advancement of Science, and belonged to the Botanical Society of Washington, American Museum of Natural History, Explorers Club of New York and the Cosmos Club of Washington.

A tireless worker, no detail was too small for his consideration if it contributed to the thoroughness of his work. The exactness and excellence of his research is largely responsible for the role that alfalfa is playing in the farm program of the country. He was soft-spoken, modest and retiring. Wherever agronomists meet Harvey Westover will be remembered not only as a fellow-scientist whose contribution was outstanding, but as a valued friend. He had an extraordinary genius for friendship. He made friends wherever he went—be it to the steppes of Russia, the hills of Spain, or the ranchos of the Americas. That warm human quality was part of him and all who came into contact with him felt and responded to it. As Fitz-Greene Halleck said of his friend, I say of mine:

> Green be the turf above thee, friend of my better days
> None knew thee but to love thee, nor named thee but to praise.

Funeral services were conducted for him in Washington, D. C., on January 3, after which his body was taken home to the hills of New York to sleep the long sleep with those of his blood.

OLAF S. AAMODT
MARY BURR PIETERS
U. S. DEPARTMENT OF AGRICULTURE,
BELTSVILLE, MD.

RECENT DEATHS

BARNARD S. BRONSON, from 1908 to 1939 professor of chemistry in the State College for Teachers at Albany, N. Y., died on March 14. He was sixty-two years old.

DR. EDGAR BILLINGS, archeologist and geologist, who had been research associate of the University of Pennsylvania Museum, the Academy of Natural Sciences, Philadelphia, and the Carnegie Institution of Washington, died on March 18 at the age of fifty-six years.

DR. ROBERT HARCOURT, head of the department of chemistry of the Ontario Agricultural College, died on March 30 at the age of seventy-seven years.

COLONEL SIR SIDNEY GERALD BURRARD, F.R.S., geologist and geographer, Surveyor-General of India from 1910 to 1919, died on March 16 at the age of eighty-two years.

SCIENTIFIC EVENTS

BRITISH PARLIAMENTARY AND SCIENTIFIC COMMITTEE[1]

ACCORDING to the annual report for 1942 of the Parliamentary and Scientific Committee, the membership now includes thirty-three organizations associated with scientific work and seventy-four members of the Houses of Parliament. During the past year, the main work of the committee has been connected with the better utilization of scientific men in the war effort.

A memorandum on the subject was prepared and a strong deputation saw R. A. Butler, then chairman of the Scientific Advisory Committee. Later, a motion urging the establishment of a Central Scientific and Technical Board was tabled in the House of Commons. This motion was allowed to lapse, after several questions designed to elucidate the position had been asked in the House, on the understanding that the functions of the scientific advisers to the Ministry of Supply would be widened as they became established. The committee is watching the position. Discussions arranged during the year dealt with the dissemination of scientific knowledge among farmers, the Industrial Health Research Board, the use of geology in wartime, pasteurization of milk and visual efficiency in factories. The secretaries of the committee have continued to issue *Science in Parliament,* which summarizes important Parliamentary proceedings relating to science and technology.

The following officers have been appointed for 1943: *President,* Lord Samuel; *New Vice-presidents,* Captain L. F. Plugge, M.P.; Professor B. W. Holman, R. B. Pilcher (Institute of Chemistry); *Chairman,* E. W. Salt, M.P.; *Vice-chairman,* Professor J. A. Crowther (Institute of Physics); *Deputy Chairman,* M. P. Price, M.P.; *Honorary Treasurer,* C. S. Garland (Institution of Chemical Engineers); *Honorary Secretary,* Dr. W. R. Wooldridge (National Veterinary Medical Association).

THE PROPOSED GEOLOGICAL UNION

F. L. AURIN, president of the American Association of Petroleum Geologists, has given out the following statement in regard to a plan for the organization of a geological union:

> During the present emergency the geologists and especially such organizations as the Geological Society of America, the American Association of Petroleum Geologists, the Society of Exploration Geophysicists and others have attempted to bring to the attention of the proper military and other governmental agencies the fact that these scientific and technical men have special qualifications applicable not only to military operations, but also to other operations in civilian capacities having a direct relation to essential and vital phases of the war effort. The results of all these efforts have not been entirely successful or satisfactory.
>
> In connection with a study of this subject, we have come to several conclusions, as follows:
>
> (1) That our greatest handicap in securing results has been the ignorance or lack of public understanding of the science of geology and related subjects and especially their application to the important military, engineering and other operations and problems connected with both the war and the peace.
>
> (2) That in order to create an understanding of geology by the public and others concerned, it will be necessary to educate the interested public and to popularize our scientific and technical accomplishments through some medium other than those now established. If such a medium is organized and the policy carried out along the proper lines, it would be of valuable assistance in supporting the present and future efforts of the geological societies during the present emergency and also future post-war conditions and adjustments.
>
> (3) That the proposed plan of Carey Croneis as outlined in his address, "Geology in War and Peace," before the Denver meeting of the American Association of Petroleum Geologists, later published in the July, 1942, *Bulletin,* and still later amplified in his address on "Geological Warfare" before the affiliated geological societies of the American Association of Petroleum Geologists, is sound, reasonable, and will fulfil the requirements of the project under consideration. In brief, Dr. Croneis proposes to form an outside organization such as an "American Geological Association" or "Geological Union" to carry out the above program. Many of the members of your society or organization are familiar with the views of Dr. Croneis, and in the event you would care to investigate the pro-

[1] From *Nature.*

posal further, it is suggested that you read the above-mentioned address. Practically all officers and members of the American Association of Petroleum Geologists and affiliated societies are extremely interested in this project.

The American Association of Petroleum Geologists will hold its annual meeting in conjunction with the Society of Economic Paleontologists and Mineralogists and the Society of Exploration Geophysicists in Fort Worth, Texas, on April 7, 8 and 9.

With this in mind, the executive committee of the American Association of Petroleum Geologists proposes to hold a meeting from 9:00 A.M. to noon, or later, if necessary, on April 10, following the conclusion of the meeting, to discuss, plan and organize the American Geological Association (or similar title). You are, therefore, invited and urged to appoint representatives to attend this meeting so that they can give you a report on the proceedings. Even though you may not feel like delegating authority to these representatives to act in behalf of your society, you are still urged to have them present and take part in the discussion and plans.

We hope that you are in accord with our views on this matter and that we will receive your hearty cooperation. Please advise the names of your representatives, if you wish to participate in this project.

THE NATIONAL CONFERENCE ON PLANNING FOR WAR AND POST-WAR MEDICAL SERVICES

THE National Conference on Planning for War and Post-war Medical Services held on March 15 a joint meeting at the Waldorf-Astoria Hotel under the auspices of the Carlos Finlay Institute of the Americas. The medical societies participating were the American Medical Association, the American College of Physicians, the American College of Surgeons, the American Drug Manufacturers Association, the American Hospital Association, the American Pharmaceutical Manufacturers Association, the American Pharmaceutical Association, the American Surgical Trade Association, the Wholesale Surgical Trade Association and the National Physicians Committee for the Extension of Medical Services.

The conference was devoted to a discussion of the spread of disease as a consequence of the war, including malaria, influenza and tropical diseases. It was emphasized that malnutrition in many lands will increase further the danger of the spread of epidemic and other diseases.

The speakers at the morning session included Lieutenant Colonel Thomas T. Mackie, Army Medical School, Washington, D. C.; Professor Thomas Francis, Jr., and Dr. Lowell T. Coggeshall, both of the School of Public Health of the University of Michigan; Dr. John B. Youmans, of the School of Medicine of Vanderbilt University. Dr. James E. Paullin, president of the American College of Physicians and president-elect of the American Medical Association, presided.

In the afternoon addresses were made by Dr. Edward C. Elliott, president of Purdue University and member of the War Manpower Commission; Colonel C. F. Shook, Army Medical Corps, and Dr. A. R. Dochez, Columbia University. Brigadier General Fred Rankin, Army Medical Corps, president of the American Medical Association, presided.

Speakers at the evening dinner-session were Nelson A. Rockefeller, coordinator of Inter-American Affairs, Washington, D. C.; Frederick P. Keppel, of New York; Norman Davis, chairman of the American Red Cross, and Dr. Morris Fishbein, editor of the *Journal* of the American Medical Association. Basil O'Connor, president of the Carlos Finlay Institute and of the National Foundation for Infantile Paralysis, was toastmaster.

CONFERENCE ON FISHERIES

THE National Research Council called a conference on February 15 and 16 of twenty-six representatives of the scientific, administrative and commercial aspects of the fishing industry, to discuss better utilization and conservation of resources of the sea and inland waters in the war effort. The conference passed the following resolution:

A serious shortage exists in the production of food fish and fish meal (an important ingredient of certain farm animal feeds) and it is in the interest of the war effort that every means be taken to increase production, not only in the United States but also in Canada, Newfoundland and Mexico, whence the United States has formerly drawn a portion of its supplies.

The conference, in examining the question, is of the opinion that the state of affairs warrants immediate study, consideration and appropriate action by the Government of the United States, and it suggests that the sympathetic cooperation of the Governments of Canada, Newfoundland and Mexico be enlisted in the task of increasing the fisheries production of North American waters.

The conference is further of the opinion that the only way to obtain large increase in production is to provide fishing vessels, gear, crews and processing plants for increased exploitation of the great oceanic fisheries.

Lesser sources of fisheries products should also be developed and utilized to the fullest possible extent.

Increased exploitation should not be applied to species that have been demonstrably over-fished.

Evidence was presented at the conference indicating that the great oceanic fisheries, herring (including pilchard), cod and haddock, could be more heavily exploited without danger of over-fishing.

WAR CONFERENCE ON INDUSTRIAL HEALTH

THE medical, surgical and industrial hygiene experts who are safeguarding the well-being of more than twenty million industrial workers have agreed to pool their knowledge and exchange their experiences regarding the many new and complex problems of wartime production. For this purpose their organizations—The American Association of Industrial Physicians and Surgeons; the American Industrial Hygiene Association, and the National Conference of Governmental Hygienists—are combining their annual meetings in a four-day "War Conference" at Rochester, N. Y., to be held from May 24 to 27. Among the problems to be discussed from a practical standpoint are:

The mass entry of women into industry;

Older-age employees, with their various associated problems; proper placement and employability considerations of the 4F rejectees;

Rehabilitation and proper employment of those already discharged from the military services because of disabling conditions;

Toxic and other hazards from new substances, new processes and the use of substitute materials;

Absenteeism; fatigue; nutrition;

Effects of long hours; double shifts; two-job workers; overtime; increased industrial accident rates;

Advances in the treatment of illnesses and injuries, and many others.

This joint meeting will be a report on the state of the nation by the men who know in matters of industrial health. Dr. William A. Sawyer, medical director of the Eastman Kodak Company, is general chairman; Dr. James H. Sterner and Lieutenant Commander J. J. Bloomfield are arranging the programs.

Physicians and surgeons, hygienists, engineers, nurses, executives—all who are interested in the problems of industrial health and their solution—are invited to attend as many of the sessions as they can arrange for; no registration fee is required.

SCIENTIFIC NOTES AND NEWS

DR. ISAIAH BOWMAN, president of the Johns Hopkins University, previously director of the American Geographical Society, has been elected president of the American Association for the Advancement of Science to succeed Dr. Arthur H. Compton, of the University of Chicago. Due to the postponement of the New York meeting Dr. Bowman was elected by mail ballot.

DR. SIMON FLEXNER, emeritus director of the Rockefeller Institute for Medical Research, of which he was director from 1920 to 1935, reached his eightieth birthday on March 25.

THE Borden Company Prize of $1,000 for research in the chemistry of milk has been awarded by the American Chemical Society to Dr. Earle O. Whittier, senior chemist of the Bureau of Dairy Industry, U. S. Department of Agriculture. The prize, which will be formally presented on April 14 at a general session of the meeting of the society in Detroit, is given in recognition of researches in the chemistry of milk constituents. These studies have been concerned chiefly with the utilization of lactose and casein, the chemistry of the manufacture and uses of lactic acid, acid-base equilibria and the buffer values of milk and milk constituents, oxidation-reduction equilibria in milk and ionic equilibria which are fundamental to a knowledge of the stability of the protein systems.

THE University of California at Los Angeles during the observance of Charter Week conferred the honorary doctorate of laws on Dr. George David Birkhoff, Perkins professor of mathematics and dean of the faculty of arts and sciences of Harvard University.

WILLIAM LOREN BATT, vice-chairman of the War Production Board and president of the SKF Industries, was presented on March 17 with the annual Philadelphia award "as the citizen who performed the most distinguished service for the city in 1942." The award carries with it the sum of $10,000.

DR. RUDOLPH MATAS has been presented with the medal of the Nu Sigma Nu Degree of Merit. This award is in recognition of approximately thirty years service rendered by Dr. Matas to the fraternity as a faculty member. Former recipients of the medal are Victor C. Vaughan, Nicholas Senn, J. P. McMurrich, W. H. Welch, F. G. Novy, G. C. Huber, W. H. Park, J. M. T. Finney, T. H. Sollmann and James Bryan Herrick.

BY action of the executive committee of the American Association of Anatomists, Professor Eliot R. Clark, of the University of Pennsylvania, has been appointed acting secretary-treasurer of the association, in the place of Professor Francis H. Swett, deceased, to serve until the next meeting at which an election may be held. While the regular meeting of the association, scheduled for Montreal, has been cancelled, two sectional meetings have been organized: one in Chicago at the University of Illinois College of Medicine on April 23 and 24, of which G. von Bonin is *secretary*, and a second in Philadelphia at

the Wistar Institute of Anatomy and Biology, on April 22 and 23, with E. J. Farris as *secretary*.

THE resignation is announced of Dr. William F. Petersen from the professorship of pathology at the College of Medicine of the University of Illinois. He plans to devote his time to research on the weather and its effect on human beings.

DR. ARNOLD LOWMAN, research chemist and specialist in the fields of food analysis, vitamin assays and pharmaceutical manufacturing, has been appointed lecturer in pharmacology at the Medical School at San Francisco of the University of California.

DR. GERTRUDE RAND has been appointed research associate in ophthalmology on the Knapp Foundation, College of Physicians and Surgeons, Columbia University.

DR. LOUISE STANLEY, chief of the former Bureau of Home Economics, has been appointed special assistant to Dr. Eugene C. Auchter, research administrator, U. S. Department of Agriculture.

DR. GERARD A. ROHLICH, assistant professor of sanitary engineering at the Pennsylvania State College, has become senior civil engineer (sanitary) in charge of the special problems group of the water and sewage unit of the Repairs and Utilities Branch, Office of the Chief of Engineers, War Department, Washington, D. C.

DR. CARLOS U. CESCO and Dr. Jorge Sahade, of the Astronomical Observatory at La Plata, Argentina, have been appointed volunteer research assistants at the McDonald and Yerkes Observatories and will arrive in the United States in the latter part of the summer. They are being sent by their government to investigate methods in astronomy and astrophysics now in use at the Yerkes and McDonald Observatories.

IN deference to a request from the Lord President of the council to the British War Office, Sir Charles Darwin, scientific adviser to the Army Council, returned on March 1 to his work as director of the National Physical Laboratory. He is succeeded as scientific adviser by Professor C. D. Ellis, Wheatstone professor of physics, King's College, London, who has been serving as deputy scientific adviser.

DR. M. J. BLISH, since 1939 chief of the Protein Division of the Western Regional Research Laboratory, U. S. Department of Agriculture, Albany, Calif., has become chief of the Research Laboratory of the Amino Products Company, a Division of International Minerals and Chemical Corporation. He is stationed at the Amino plant at Rossford, Ohio, and is working under the direction of Dr. Paul D. V. Manning. Ralph W. Shafor, for the past thirteen years manager of the beet sugar division of the Petree and Dorr Company, New York City, also has joined the staff of the corporation.

DR. WILLARD M. HOEHN has been promoted to the position of assistant director of the laboratories George A. Breon and Company, Kansas City, Mo. He is in charge of the research program on sterol compounds.

WILLIAM J. PRIESTLY, chief of the alloy-steel branch of the War Production Board, has resigned to return to the position of vice-president in charge of research and development of the Electro-Metallurgical Company, New York. He is succeeded by Louis E. Creighton, of Detroit, who for the present will continue to serve also as chief of the aircraft alloy steel section.

DR. CHARLES M. SLACK, of the Westinghouse Electric and Manufacturing Company, has been appointed assistant research director of the lamp division at Bloomfield, N. J.

PROFESSOR ALLYN C. SWINNERTON, for twenty-one years head of the department of geology at Antioch College, has leave of absence to undertake work in Washington, D. C., as consultant to the Research and Development Division of the Signal Corps.

DR. JULIAN A. STEYERMARK, assistant curator of the herbarium at Field Museum of Natural History, has leave of absence for the duration of the war to enable him to accept an appointment from the Board of Economic Warfare of the United States Government to work in Central and South America on the cinchona project. He has left Chicago to fly to Guatemala City, which will be his first headquarters.

A TOUR is being made of American meteorological stations and weather bureaus by meteorologists of the USSR. The party includes Captain Constantin C. Speranski, of the Soviet Navy, assistant director of the Soviet Hydrometeorological Service, Moscow; Major Mark I. Lvovitch, army hydrologist at the Soviet Hydrological Institute at Sverdlovsk, and Lieutenant Colonel Serapion Pagava, army chief of the Long Range Forecasting Division of the Central Meteorological Institute, Moscow. The party is accompanied by interpreters and by U. S. Army officials.

DR. DUNCAN A. MACINNES, member of the Rockefeller Institute for Medical Research, is giving from March 22 to 26 the annual series of Priestley lectures at the Pennsylvania State College. The series, sponsored by Phi Lambda Upsilon, is now in its seventeenth year, having been initiated in 1926 by Dr. Wheeler P. Davey, research professor of chemistry and physics.

DR. W. H. SEBRELL, surgeon of the Public Health Service of the National Institute of Health at Bethesda, Md., gave an address entitled "Nutrition in a Changing World" at the opening session of a conference on "Nutrition in War Time," held at the Medical College of Virginia on March 25, 26 and 27.

DR. W. F. G. SWANN, director of the Bartol Research Foundation at Swarthmore, Pa., lectured on the evening of March 18 before the Lancaster, Pa., Branch of the American Association for the Advancement of Science. The lecture was entitled "Science in This Confused Age."

PROFESSOR LAURENCE H. SNYDER, chairman of the department of zoology of the Ohio State University and chairman of the Committee on Human Inheritance of the National Research Council, gave lectures on February 9 and 10 at Louisiana State University. The main address, "Heredity and Modern Life," was sponsored jointly by the department of zoology and the university chapter of the Society of Sigma Xi. The second lecture was presented before the seminar in zoology. It was entitled "The Mutant Gene in Man." Dr. and Mrs. Snyder were guests of honor at a tea given by the department on February 9, and on the following day at a dinner at the Faculty Club.

PLANS have been made to hold the thirty-fourth annual meeting of the American Oil Chemists Society in New Orleans from May 12 to May 14. The Roosevelt Hotel has been selected for headquarters, and all technical sessions, committee meetings and a dinner-dance will be held there. The local committee, headed by Dr. K. S. Markley, of the Southern Regional Research Laboratory, New Orleans, is arranging a program that will include the chemical, analytical, technological, industrial and economic phases of the production and utilization of fats and oils. All who plan to attend should make hotel reservations as early as possible.

CHANGES in the staff of editors of *Biological Abstracts* within the last few months include: Dr. Gustav Swanson, University of Minnesota, editor of "Wildlife Management—Terrestrial," replacing Dr. W. L. McAtee, who has resigned; Dr. Francis O. Schmitt, Massachusetts Institute of Technology, editor of the section "Biochemistry-Biophysics"; Dr. W. G. Andberg, University of Minnesota, succeeding Dr. C. E. Blye, acting editor of the section, "Veterinary Science"; Dr. F. E. J. Fry, University of Toronto, editor of the section "Cyclostomata, Elasmobranchii and Pisces," beginning with the April, 1943, issue; Dr. J. H. Black, 1405 Medical Arts Building, Dallas, Texas, editor of the "Allergy" section, beginning with the June–July issue. Dr. August E. Miller, Dayton, Ohio, has resigned as the editor of the Acarina section.

ACCORDING to *Nature* sound films of honorary members and Faraday medallists of the British Institution of Electrical Engineers are being shown before the institution as follows: March 4: Sir J. J. Thomson and Lord Rutherford; April 1: Sir Ambrose Fleming and Dr. A. E. Kennelly; April 29: Lord Hirst and Dr. F. B. Jewett.

FIRE completely destroyed the one-story frame anatomy building of the University of Kansas at Lawrence, on the evening of March 3. A part of the equipment of the department was saved. The fire started in the southwest part of the building and fanned by a strong wind the contents of the office in that part of the building were completely destroyed. All the charts, models and demonstration material for gross anatomy were lost, but the metal dissecting tables and the cadavers were saved. Most of the slides and charts for the class in microscopic anatomy were saved. Glasswork is being continued temporarily in Snow Hall, the biology building.

GIFTS amounting to $201,921 have been made to New York University during the past three months. They include $100,000 from the George F. Baker Charity Trust, half of which will be used to increase the endowment of the Samuel A. Brown professorship of therapeutics and the remainder for the College of Medicine, at the discretion of Dean Currier McEwen. The Commonwealth Fund gave $9,784 to the College of Medicine for the study of hypertensive and renal diseases, research in obstetrics and gynecology and other uses, and the National Conservation Bureau gave $9,000 to the Center for Safety Education in the Division of General Education. The National Foundation for Infantile Paralysis contributed $7,500 toward the recently established training program for physiotherapists which was opened by Sister Elizabeth Kenny in the School of Education. A gift of $7,500 was made by the Rockefeller Foundation for various research projects in medicine and applied mathematics. Alumni and friends of the College of Medicine, through Dean McEwen, gave $6,794 to the emergency fund, and the Alfred P. Sloan Foundation, Inc., gave $5,277 to the Educational Film Institute and the Recordings Division of the Film Library. The sum of $2,850 was received from the Josiah Macy, Jr. Foundation for the Vitamin "B" Filtrate Factor Fund, and $1,800 from the John and Mary R. Markle Foundation for the Endamoeba Histolytica Research Foundation for study of the disease under the direction of Professor Robert Chambers.

DISCUSSION

THE COURTING FLIGHTS OF TABANIDS

MOST species of insects are represented by both males and females, and normally mating occurs the same as in the higher animals. The males may use any one of several approaches to the act of copulation. Some use the primitive cave man method of manhandling the female without preliminary courtship. Others may stimulate the mating desire in the female by furnishing glandular secretions, probably containing sex hormones, which she eats. Still others lull the female into submission by offering her titbits, with odors, bright colors or with monotonous hypnotic music. The males of the common horseflies or tabanids, seemingly, resort to the use of the musical hum of their wings and their peculiar dizzy courting or hovering flights for attracting the females. Few workers in this country have observed and described these courting flights and the mating of tabanids. Mosier and Snyder[1] observed the early morning courting flights of *Tabanus americanus* in the Florida Everglades in 1917 and 1918. J. S. Hines,[2] in Ohio, observed *Tabanus sulcifrons* in the act of mating between 8 and 9 o'clock in the morning during mid-August. However, he apparently did not observe the courting flights which occur earlier just at daybreak.

During the past summer and early fall, the writer made rather extensive observations on the courting flights of the males of the two species of tabanids, *T. sulcifrons*[3] and *T. giganteus*[3] at Columbia, Missouri. The first species is the medium-sized, brown horsefly so common during the summer and early fall in Missouri. It was first heard and seen hovering in great numbers above elm, walnut and hickory trees in the writer's lawn at 5:30 in the morning of July 27, though it probably began these courting flights prior to that date. Its hum resembled that of drone honeybees or large blowflies, and its flights observed in previous summers were mistaken for those of blowflies. These flights continued until September 2. The flights always began just at daybreak when the light intensity was still only a fraction of one foot-candle and they continued for 20 to 25 minutes and ceased by the time the light intensity reached three to five foot-candles. At no time did the flies hover nearer the ground than 30 feet. Most of them continued to hover at tree-top level, except as they began to disperse, when they would often rise and hover high above the trees for a few minutes. The courting flights included only the males, though the females were always on wing about the lawn and low shrubs. Two males in the act of hovering were taken with a net from the roof of the house. As the summer advanced and the days grew shorter, the flights began later so that by September 1 they did not begin until a few minutes after 6 o'clock. The courting flights of this fly did not occur when the temperature was below 60° F. and they seemed to be confined to scattered rather restricted areas. A number of others here around Columbia reported seeing them during the summer. Just why the males of this species perform these 20-minute courting flights at daybreak when, according to Hines' observations, mating occurs at 8 o'clock in the morning, or the equivalent of 9 o'clock central war time, is difficult to understand. On the other hand, cocks do much of their crowing at this same twilight period. During the courting flight period, females were found to have well-developed eggs, but in no case was copulation observed.

In the fall, as this brown species became less abundant, the larger, dark species, *T. giganteus*, became more abundant. On September 9, several males of this species were seen hovering three to five feet above the writer's lawn and driveway not at daybreak but just at dusk. The courting flights of this species continued for only about a week and the last males were observed on September 15. Three specimens taken with a net on September 9 were males with fully developed testes, and during the courting flight period females were taken repeatedly, but in no case was mating observed. For their courting flights, this species seemed to require more light, as they began soon after 7 o'clock in the evening with a light intensity of about 30 foot-candles and continued for some thirty minutes, ceasing when the light had dropped to an average of about 3 foot-candles. This species would often hover, seemingly without fear, only a few feet from the observer, which made it possible to note their fully distended body, alertness to moving objects, and their tendency to reverse their direction after hovering almost motionless in one spot for several seconds. The pitch of the hum of this species was considerably lower than that of the smaller brown species.

That these peculiar hovering flights of male horseflies have some connection with mating seems certain,

[1] Mosier and Snyder, *Proc. Ent. Soc. Wash.*, 20, 115, 1918.

[2] J. S. Hines, *USDA Bur. Ent. Tech. Ser.*, No. 12, Part III, p. 24, 1906.

[3] Determinations made by Dr. Alan Stone, USDA Bur. Ent. and Plant Quarantine.

but these observations throw little light on just what that connection really is.

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MALARIAL CRYPTOZOITES

THE recent attention which has been directed at the initial stages in the early schizogonic or asexual cycles of malarial parasites has revealed an inadequacy in terminology which it seems desirable now to correct. The stage which initiates this cycle is, of course, the sporozoite which is the end product of the sporogonous cycle in the mosquito. If the theory of Schaudinn were correct that sporozoites enter directly into erythrocytes and transform into trophozoites and schizonts the present terminology would be adequate. However, there is both direct and indirect evidence that this direct entry does not occur, but that development occurs elsewhere in the body before the erythrocytes are invaded. There is the choice of expanding our conceptions of the terms, trophozoite and schizont, to include any such stages in the life-cycle or of proposing a new term for the stages in question. We believe that the latter course is preferable, since the terms, trophozoite and schizont, have become so definitely associated with stages of the malarial parasites which live in erythrocytes.

For the first generation, exoerythrocytic stages of the parasite which develop from sporozoites we propose the name "cryptozoite." This term is chosen because (1) historically these stages remained hidden for a long time and (2) they are even now difficult to demonstrate. The zoological term "cryptozoic," referring to animals which inhabit dark, hidden places is already in use. We suggest that in the use of the new word care should be taken not to apply it specifically to any particular type of parasite falling within the above definition. Different types of cryptozoites might be described as uninucleate cryptozoites, multinucleate cryptozoites, cryptozoic schizonts, etc. Since, by definition, a cryptozoite is an exoerythrocytic stage of the parasite it should be emphasized that the converse is not necessarily true. In fact, it is definitely known that some exoerythrocytic stages arise from erythrocytic parasites. If further investigation should reveal that in some species of malarial parasites there is direct entry of the sporozoite into the erythrocyte it would suffice in describing the schizogonous cycle of such species to indicate that they lacked any cryptozoic stages. Moreover, if the cryptozoites of various species should prove to fall into various types, the procedure followed by Porter[1] in reference to exoerythrocytic stages might be adopted. He indicated that there are at least two types of exoerythrocytic stages, *elongatum*-type and *gallinaceum*-type, according to whether they resembled the predominating exoerythrocytic stages of these two species of *Plasmodium*. We realize that research will need to be done on each species of malarial parasite to determine in each case the length of life, the synchronism, the tissue affinities and the fate of cryptozoites.

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THE NEPHELINIZED PARAGNEISSES OF THE BANCROFT REGION, ONTARIO

A TOTAL of more than seven months was spent in the field in the Bancroft-Haliburton region of Ontario in 1941. A detailed geological and topographical map was prepared of the important area of nepheline-bearing rock to the immediate east of Bancroft village; the map is somewhat different from all previous maps of that area. Other areas were examined in varying detail. A great deal of thin section examination was carried out, and many analyses were made.

All the evidence gathered points to a parasedimentary origin for the nepheline-bearing rocks. They are interbanded conformably with a series of Grenville-type micaceous paragneisses and crystalline carbonate rocks. Delineation of the belt of rocks to the east of Bancroft indicates a fold, probably a syncline plunging east, and crossfolded north and south. The central and outer bands, enclosing the nepheline-rich gneisses, are composed dominantly of nepheline-poor and nepheline-free gneisses of great variety. Gradations in nepheline content both along and across the strike were noted. There is crystalline limestone of several degrees of purity around the limbs of the fold, and a good deal of it is to be classed as "flow marble."[1]

Several points indicate that the nepheline came into existence through a process analogous to granitization, differing only in the chemistry of the reactions. Osborne[2] believed that some nepheline rocks were replacements. Also, it is believed that the nephelinization is post-folding, since the flow marble contains fragments of all rocks except those containing nepheline,[1] and the zones richest in nepheline are in the shape of drag folds along the limbs of the major structure which suggest that structural openings localized intense nephelinization.

No evidence of the existence of a nepheline syenite magma was noted except in the case of certain of the nepheline pegmatites, many of which appear to be the result of regeneration of the nepheline of the paragneisses, and others of which may have been sec-

[1] R. J. Porter, *Jour. Inf. Dis.*, 71: 14, 1942.

[1] F. Chayes, *Bull. Geol. Soc. Amer.*, LIII, 1942.
[2] F. F. Osborne, *Amer. Jour. Sci.*, XX, 1933.

ondary magmas, perhaps fluxed by CO_2 released by reactions of granitic or syenitic juices on limestone. Most of the nepheline pegmatites appear to be replacements to more or less degree.

The visible granite is definitely post-nepheline in age, but apparently has caused a large amount of albitization. Quartz-bearing dike rocks cut the nepheline rocks.

The authors contend that the limestone-syntexis theory is at fault mainly in mechanics; however, the chemical reactions embodied may apply under the present theory. The exact composition of the sediments prior to nephelinization is not understood, but they appear to have been impure limey rocks. Calcite is present in all the rocks examined and is perhaps least in those richest in nepheline. The solutions causing the alteration may have been normal granitic or syenitic liquors rich in Na_2SiO_3, and probably contained Al_2O_3 and Fe_2O_3. The source of the solutions is also indeterminate; they may have come from an earlier unexposed granitic or syenitic body, or may have been related to the visible intrusions that manifested themselves at first merely by exhalations, and later by actual near-surface intrusion and caused the albitization of the rocks formed by their first action.

Comparison is made of the Bancroft area with other areas in the major belt of alkaline rocks and serves only to strengthen the thesis of origin.

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SCIENTIFIC BOOKS

PETROLEUM REFINING

Chemical Refining of Petroleum. By VLADIMER A. KALICHEVSKY and BERT ALLEN STAGNER. Revised edition. 550 pp. New York: Reinhold Publishing Corporation. 1942. $7.50.

THIS is a thorough revision of the authors' valuable text and reference book, the first edition of which appeared in 1933. In the revised edition the text material has been expanded from 352 to 416 pages, the supplementary list of U. S. patents on petroleum refining occupies 79 pages and includes only patents not discussed in the text and not listed in the first edition, in which the list of patents on the subject covered only 25 pages and included foreign patents. In the revision no material change has been made in the conversion and other tables given in the first edition, but a 12-page glossary of terms has been omitted from the revised edition. The indices include an index of patent numbers and an author's index, as well as the subject index which covers both the text and the supplementary list of patents.

While there have been only a few changes in the general arrangement of the text, it has been almost completely rewritten and much new material introduced. Chapter I, on the composition of petroleum, discusses the classes of compounds and the principal products. A brief section on analysis of petroleum hydrocarbons mentions the use of new chemico-physical methods and refers to recent researches which fix the composition in terms of the characteristic radicals rather than by attempting to isolate individual compounds. This is followed by a long chapter (75 pages) on treatment with sulfuric acid, containing new material on polymerization of unsaturated compounds, cold acid treatment of cracked naphthas, low temperature treatment and octane rating, and distillation after treatment. Other sections of this Chapter II have been rewritten and somewhat enlarged. At the end is a bibliography of 265 references on acid treatment. These bibliographies at the end of each chapter constitute a favorable feature of the book.

Chapter III discusses acid sludge and its disposal, recovery and concentration of sulfuric acid; and contains a new section on removal of hydrogen sulfide from cracked gases and its use in manufacture of sulfuric acid. In Chapter IV, on treatment with alkaline reagents, new material, particularly on the extraction of mercaptans, has been introduced. Both of these chapters have been largely rewritten.

Chapter V covers sweetening operations and elimination of elemental sulfur, which made up Chapter IV of the first edition, as well as the reduction of total sulfur in light distillates, which was the subject-matter of Chapter VII in the previous edition. As an introduction to these subjects the laboratory analysis of oils for various sulfur compounds, and tests for corrosiveness in oil are discussed in some detail. In the discussion of sweetening operations the oxidation of mercaptans by elemental sulfur, by oxygen or air, and by alkali hypochlorite is followed by new material on the extraction of mercaptans. The sodium plumbite ("doctor solution") treatment has been well elucidated; consideration of recent researches on the subject and of sweetening before acid treatment or before distillation is included. Sweetening by means of lead sulfide, other sulfides, copper salts and hypochlorite have shown little development and the text therefore follows largely the material given in the first edition. New sections on extraction of mercaptans by increasing the solvent power of caustic alkali solutions and

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[4] Geologist, Aluminum Company of Canada, Ltd., Arvida, Quebec.

by treatment with alcoholic solutions of alkalies and alkali metals include discussions of the solutizer and methanol extraction processes and reflect new developments in this field. In the section on reduction of total sulfur in light distillates, new material consists of the catalytic desulfurization (Houdry) process and the perco process. Other processes are briefly given and it is stated: "as yet the only method that has come into extensive use for desulfurizing gasoline, straight-run or cracked, is that of strong sulfuric acid under carefully controlled conditions, as described in Chapter II."

Chapter VI expounds refining by absorption; it has been largely rearranged and much improved. The following divisions have been rearranged and enlarged: Classification, methods of preparation, chemical and physical properties and methods of testing absorbents; refining by percolation, contact filtration and regeneration of absorbents. Contact decolorization and refining of both light and heavy oils has been clarified by rearrangement; vapor phase refining with absorbents has been much enlarged and classified under the Gray process and the Houdry catalytic process. New material in this chapter includes: A section on color of petroleum oils with discussion of methods and references on relations between color scales; table showing effect on color of temperature and time of contact with different clays; and a new section on filtrol fractionation.

Chapter VII, in spite of the rapid development in refining by solvents, is shorter than the corresponding chapter in the first edition. This exception is well justified, the explanation being the appearance in the meantime of an excellent book ("Modern Methods of Refining Lubricating Oils," by V. A. Kalichevsky, New York, 1938, Reinhold Publishing Co.), which is devoted mainly to solvent refining and to which reference is made for details of the subject. This enables the authors to make a summary of the subject in Chapter VII, and as such it is the best which has come to the reviewer's attention.

Completing the second edition are four short chapters on detonation and antidetonants; inhibitors of atmospheric oxidation of petroleum products, antioxygens; gums in cracked petroleum products; and finally deterioration of lubricating and similar oils, addition agents. These are well written, authoritative and bring the treatment of the subjects up-to-date.

JEROME J. MORGAN

ORGANIC CHEMISTRY

Organic Chemistry. An Advanced Treatise. By HENRY GILMAN, editor-in-chief. Editorial board: Roger Adams, Homer Adkins, Hans T. Clarke, Carl S. Marvel and Frank C. Whitmore. Second edition. Vol. I, pp. 1–1077; Vol. II, pp. 1079–1983. New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Limited. 1943. 6¼ × 9¼ in. Bound in green buckram. $7.50 per vol.

FEW recent treatises on chemistry by American authors have received, both here and in other countries, such a universal and enthusiastic welcome and commendation as the first edition of this work. From the date of its publication in 1938, it has been regarded as an outstanding and authoritative contribution to the literature of its subject. This new edition, therefore, which brings many of the chapters in the previous one up to date, and introduces some new ones, is assured of a most cordial reception by all organic chemists.

Chapters in the older edition which do not appear in the new one are: Open-chain nitrogen compounds; The chemistry of pyrimidines, purines and nucleic acids; Carotenoids: The polyene pigments of plants and animals; and Rotatory dispersion. On the other hand, the edition under review contains the following new chapters: The reactions of aliphatic hydrocarbons (Egloff), Synthetic polymers (Marvel and Horning), Catalytic hydrogenation and hydrogenolysis (Adkins and Shriner), Organic sulfur compounds (Connor), Aliphatic fluorides (Henne), The chemistry of the porphyrins (Corwin), Chlorophyll (Steele) and The redistribution reaction (Calingaert).

In addition to members of the editorial board, twenty-five other distinguished chemists make up the list of contributors. The books are indispensable to the organic chemist who wishes to keep in the forefront of his profession.

In purpose, plan, scope and format, the new edition resembles the old, except that the color of the binding is green instead of maroon. The work of the printers and publishers is excellent in every respect.

MARSTON TAYLOR BOGERT

CARDIOLOGY

A Short History of Cardiology. By JAMES B. HERRICK, M.D., emeritus professor of medicine, Rush Medical College, consulting physician to Presbyterian Hospital, Chicago. 258 pp. Springfield, Ill., and Baltimore, Md.: Charles C Thomas. 1942.

IT is appropriate that Dr. James B. Herrick, the dean of American cardiologists, should have chosen to record a history of his beloved subject. The ever-increasing publication of articles and books in America dealing with the history of medicine is eloquent testimony that the culture of American medicine is reaching its adult stage.

This short history of cardiology is well written and its interesting narrative style and logical sequences maintain the reader's constant attention and interest.

No noteworthy contributors among the ancients and semi-moderns have been omitted. Herrick, very appropriately, deals only briefly with the ancient physicians, for the real dawn of scientific cardiology coincides with Harvey's monumental dissertation, "De Motu Cordis" in 1628. Prior to this publication knowledge regarding the anatomy and the physiology of the heart and circulation was erroneous and fantastic and constructive advances in knowledge and understanding were only possible after correct, although unfinished concepts were clearly formulated.

The evolution of the science of cardiology up to the present time, although yet incomplete, is accurately portrayed. The correct basic premise of the anatomy of the heart and circulation inevitably led to physiologic understanding, the development of cardiovascular pathology, clinical cardiology and finally the more modern adjuncts such as roentgenography and electrocardiography.

Herrick, an outstanding clinician, has been remarkably able to present this brief but comprehensive work in a manner having particular appeal and interest to the internist. This is a book which merits the attention not only of the cardiologist, but all physicians and medical students.

F. A. WILLIUS

SPECIAL ARTICLES

A VIRUS RECOVERED FROM PATIENTS WITH PRIMARY ATYPICAL PNEUMONIA[1,2,3]

PRIMARY atypical pneumonia appears to be a clinical syndrome, but is probably not a single disease entity. The psittacosis group of viruses[4,5,6] *Rickettsia diaporica*,[7] and a virus infectious for the mongoose[8] each have been found to be etiologically related to certain groups of cases. That still other agents[9,10,11] may be associated with the syndrome has been suggested.

In this study specimens from patients were inoculated in different animal species by numerous routes and serial passages were carried out. In no instance were obvious signs of infection produced which could be reproduced in series. However, it was discovered that animals inoculated with certain specimens or with passage material from them developed antibodies capable of neutralizing a heterologous virus; the "pneumonia virus of mice"[12] hereinafter referred to as PVM. This observation suggested that there were in the agent recovered from current cases and in PVM minor common antigens.

Twelve strains of a virus have been recovered from 20 patients. Two were obtained from throat-washings, eight from sputa and two from plasma. All 12 possessed antigenic components also present in PVM. Although none produced obvious signs of infection on passage in available animals, nevertheless, immunological evidence indicated that the agent could be passed in series in both chick embryos and cotton rats. The virus was filterable through Berkefeld V candles, did not lose activity on storage at −70° C for 6 months, withstood freezing and thawing 10 times, and was inactivated by heating at 56° C for 30 minutes.

Three filtered throat washings were inoculated in chick embryos and serial passages carried out. Rabbits injected with embryo material from one throat washing developed neutralizing antibodies against PVM, whereas rabbits injected with embryo material from the other throat washings did not.

Two specimens of plasma were tested, one intravenously in a rabbit, and one was inoculated in chick embryos with which rabbits were immunized. These rabbits produced neutralizing antibodies against PVM. As might be expected, PVM itself stimulated the production of neutralizing antibodies in rabbits more rapidly and in far higher titer than did the agent obtained from patients with primary atypical pneumonia.

Eighteen specimens of sputum and one throat washing were tested intranasally in cotton rats. Eight of the sputa and the throat washing stimulated the production in rats of neutralizing antibodies against PVM whereas the other 10 sputa did not. Of 32 normal cotton rat sera tested none contained antibodies against PVM. As was anticipated PVM itself

[1] From the United States Navy Research Unit at the Hospital of The Rockefeller Institute for Medical Research, New York, N. Y.

[2] The Bureau of Medicine and Surgery does not necessarily undertake to endorse views or opinions which are expressed in this paper.

[3] The work described in this paper was done under a contract, recommended by the Committee on Medical Research, between the Office of Scientific Research and Development and The Rockefeller Institute for Medical Research.

[4] M. D. Eaton, M. D. Beck and H. E. Pearson, *Jour. Exper. Med.*, 73: 641, 1941.

[5] K. F. Meyer, *Medicine*, 21: 175, 1942.

[6] J. E. Smadel, *Jour. Clin. Investig.*, 22: 57, 1943.

[7] R. E. Dyer, N. H. Topping and I. A. Bengtson, *Pub. Health Rep.*, 55: 1945, 1940.

[8] J. M. Weir and F. L. Horsfall, Jr., *Jour. Exper. Med.*, 72: 595, 1940.

[9] J. A. Baker, SCIENCE, 96: 475, 1942.

[10] M. D. Eaton, G. Meikeljohn, W. Van Herick and J. C. Talbot, SCIENCE, 96: 518, 1942.

[11] F. G. Blake, M. E. Howard and H. Tatlock, *Yale Jour. Biol. and Med.*, 15: 139, 1942.

[12] F. L. Horsfall, Jr. and R. G. Hahn, *Jour. Exper. Med.*, 71: 391, 1940.

stimulated the production of neutralizing antibodies in rats more quickly and in higher titer than did the human virus.

The human agent was passed in series either in cotton rat lungs or in chick embryos as well as on the chorio-allantoic membrane. Evidence for the presence of the agent in passage material was obtained by the demonstration of neutralizing antibodies against PVM in the sera of inoculated cotton rats. Histological sections of infected rat lungs and infected egg membranes stained by the Giemsa method, and impression films stained by the Macchiavello or Gram method failed to reveal the presence of elementary bodies, inclusion bodies, rickettsiae or bacteria.

The mongoose infectious virus[8] was restudied in the light of these findings. A suspension of infected mongoose lungs, stored at −70° C for over 2½ years, was available. Cotton rats were inoculated intranasally with this material and lung passages were carried out. None of the rats showed visible signs of infection and pulmonary consolidation was not produced. The suspension of infected mongoose lungs was also inoculated on the chorio-allantoic membrane and passages carried out. Cotton rats inoculated either with the lung or membrane passage material produced neutralizing antibodies against PVM indicating that the mongoose infectious virus possessed antigenic components also present in PVM and moreover that it could be passed in cotton rats as well as chick embryos.

Neutralization tests with patients' sera and the human agent were difficult to devise since the virus failed to produce signs of infection on passage in available animals. However, advantage was taken of the fact that a large supply of one sputum known to contain the agent was available and that this particular sputum on primary inoculation in cotton rats, though not on serial passage, produced definite pulmonary consolidation. Eaton and his coworkers[10] have reported that sputa from certain cases contained an infectious agent which produced pulmonary consolidation in cotton rats.

Of 32 cotton rats inoculated with this sputum pulmonary consolidation developed in 78 per cent. Furthermore, without exception, rats inoculated with this sputum produced neutralizing antibodies against PVM. When diluted to 1 per cent. with broth the sputum still caused consolidation in rats. Equal parts of a 20 per cent. suspension of the sputum and either undiluted acute phase or convalescent serum, previously inactivated from 11 patients, were mixed. Each mixture was tested in a group of 3 or 4 cotton rats. With the sputum-acute phase serum mixtures from 6 patients, 68 per cent. of 25 inoculated rats developed pulmonary consolidation, whereas with the sputum-convalescent serum mixtures from the same 6 patients, none of 25 inoculated rats developed pulmonary consolidation. With the sera obtained from 5 other patients mixtures of the sputum and either acute phase or convalescent sera failed in all of 32 rats to produce pulmonary consolidation. It seems noteworthy that all 11 convalescent sera completely neutralized the agent responsible for consolidation in cotton rats.

Convalescent human sera not only neutralized the agent responsible for pulmonary consolidation but also neutralized the agent responsible for the stimulation of antibodies against PVM in cotton rats. Moreover, rats inoculated with the human virus or with chick-embryo material infected with it produced antibodies which neutralized not only PVM but also the agent in the sputum responsible for consolidation in cotton rats. On the other hand, cotton rats inoculated with inactive material failed to develop neutralizing antibodies against either PVM or the human virus. This evidence suggests that pulmonary consolidation in the cotton rat and the development of antibodies against PVM were the result of infection by one and the same agent.

Acute phase and convalescent sera from these 11 patients were also tested against PVM itself. In no case was an increase in neutralizing antibodies against PVM demonstrable during convalescence. This observation may be explained on the basis that the antibody response of human beings to the antigenic components common to both the human virus and PVM may be too small to be measured by the technique employed. All the human sera were also tested against psittacosis virus, and with but one exception against lymphocytic choriomeningitis virus antigen as well, using the appropriate complement fixation procedures.[6,13] All the human sera as well as all the immune rabbit sera and many of the immune cotton rat sera were also tested against influenza A and B viruses, using the RBC agglutination inhibition technique.[14] In no instance was a significant increase in antibodies against any of these four viruses demonstrable.

The available evidence suggests that the mongoose infectious virus, which appeared to be etiologically related to certain cases of primary atypical pneumonia studied in 1939, is related antigenically to the heterologous virus of mouse origin, the "pneumonia virus of mice." Since all twelve strains of the agent recovered from current cases of atypical pneumonia appear also to be antigenically related to PVM, it seems reasonable to think that they are either identical with the mongoose infectious virus or are very closely

[13] J. E. Smadel and M. J. Wall, *Jour. Exper. Med.*, 72: 389, 1940.

[14] G. K. Hirst, *Jour. Exper. Med.*, 75: 49, 1942.

related to it both in antigenic composition and biological characteristics.

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GONADECTOMY AND ADRENAL NEOPLASMS

CARCINOMA of the adrenal cortex is a relatively rare type of tumor in both man and in experimental animals. In man these neoplasms have been of unusual interest because of sexual disorders which have been associated with them. In experimental animals, carcinomas of the adrenal cortex have appeared too infrequently for critical study. Observations in this laboratory, however, indicate that primary carcinomas of the adrenal cortex can be produced in a high percentage of the individuals of at least one strain of mice by means of gonad removal.

It has been found that when mice of the extreme dilution strain (ce) w gonadectomized at two days of age, carcinoma of the adrenal cortex occurred in a high percentage of cases. Table 1 shows the frequency of these in various age groups up to one year. No such tumors have so far been observed in normal male and female mice of the ce strain. Adrenals of these mice are being studied in more detail, however.

Present knowledge indicates that sex hormones have an influence in the formation of certain types of neoplasms in mice. Increasing or decreasing these hormones is effective. It has been shown that injections of estrogenic hormones have been instrumental in

TABLE 1

Sex	Mice of ce strain, Age at autopsy: 4 months		6–7 months		8–10 months		11–12 months	
	No. of mice	Per cent with adrenal cancer	No. of mice	Per cent with adrenal cancer	No. of mice	Per cent with adrenal cancer	No. of mice	Per cent with adrenal cancer
Ovariectomized ♀♀ ...	4	0	9	88.9	3	100	6	100
Castrated ♂♂.	4	0	7	28.6	7	85.7	5	100

producing interstitial cell tumors of the testes,[1] carcinomas of the cervices,[2] adenomas of the hypophyses[3] and mammary gland carcinomas[4] in mice. In the dba strain of mice gonad removal resulted in nodular hyperplasia of the adrenal cortex and carcinomatous changes of the mammary gland in both sexes.[5, 6] It seems likely that all these results may be explained by the theory that hormonal imbalance is at least one of the factors leading to these forms of cancer. A more detailed study is to be reported elsewhere.

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SCIENTIFIC APPARATUS AND LABORATORY METHODS

IMPROVED APPARATUS FOR LIVER PERFUSION

LIVER perfusion studies in which the R.Q. of the liver was found from the arterio-venous blood gas differences have resulted in extremely low R.Q.'s which have been interpreted as support for the theory that oxygen is being utilized by the liver in the formation of carbohydrate intermediates from fatty acid or fatty acid intermediates. The methods used in former studies did not control or measure the escape of CO_2 from the surface of the liver. It is conceivable that the amount of CO_2 passing from the liver into the surrounding air is considerable and would be related to the tension of the CO_2 in the perfusate and the production of CO_2 by the liver. If this loss of CO_2 from the liver could be measured exactly in terms of volumes per cent. of CO_2, the A.V. R.Q. could be corrected for the amount lost.

The escape of appreciable amounts of CO_2 is demonstrable by perfusing the liver in an air-tight tin box of known volume as shown in the accompanying diagram (Fig. 1). The box is washed out with warmed outside air at the start of the experiment. At the end of a given period of time the air in the box is sampled and analyzed for CO_2 and O_2. The CO_2 which enters the box from the surface of the liver is expressed in volumes per cent. from the total volume of perfusate passing through the liver during the period. The oxygen level in the box remains constant providing there are no leaks in the circulating system.

In Table 1 the average loss of CO_2 in volumes per

[1] C. W. Hooker, W. U. Gardner and C. A. Pfeiffer, *Jour. Am. Med. Asn.*, 115: 443–445, 1940.
[2] E. Allen and W. U. Gardner, *Cancer Research*, 1: 359–366, 1941.
[3] W. Cramer and E. S. Horning, *Lancet*, 1: 247–249, 1936.
[4] A. Lacassagne, *C. R. Acad. Sci.*, 195: 630, 1932.
[5] Elizabeth Fekete, George Woolley and C. C. Little, *Jour. Exp. Med.*, 74: 1–8, 1941.
[6] George Woolley, Elizabeth Fekete and C. C. Little, *Endocrinology*, 28: 341–343, 1941.

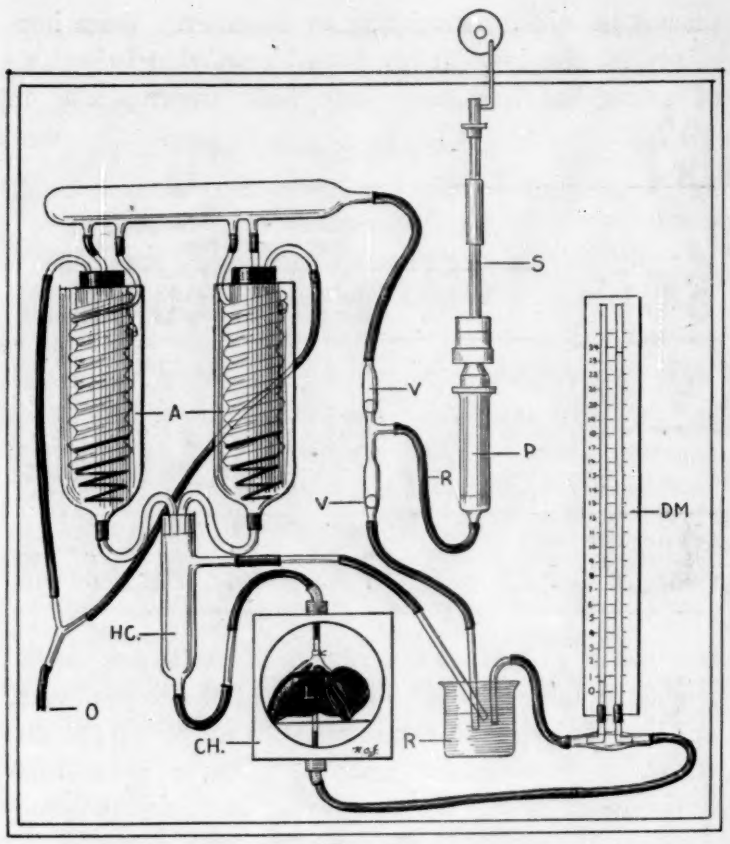

FIG. 1

cent. is 0.25 vol. per cent. This loss of CO_2 from the surface of the liver is sufficient to explain many of the R.Q.'s (arteriovenous) below the level found for the whole organism during starvation, reported in the literature (*e.g.*, Blixenkrone-Møller.[1]).

TABLE I

Arterial Vol. % CO_2	Venous Vol. % CO_2	Vol. % Diff.	A.V. R.Q.	Venous return cc/min gm of liver	ml CO_2 lost min gm of liver	Vol. % correction	Corrected R.Q.
11.01	11.56	0.55	.42	1.8	.0073	.26	.610
9.57	10.37	0.80	.73	1.8	.0055	.26	.965
7.71	9.87	1.87	.57	0.8	.0041	.48	.880
5.5	6.35	.85	.43	2.6	.0039	.19	.530
11.10	12.05	.95	.74	1.8	.0038	.21	.907
6.38	6.85	.47	.66	2.5	.0035	.13	.840

The apparatus shown (Fig. 1) is designed to eliminate several other sources of error as well in the perfusion technic, such as the loss of fluid by evaporation, wide fluctuation in CO_2 and O_2 levels of the perfusate, edema of the liver, turgence and discoloration caused by excessive hydrostatic pressure. Pressure can be kept constant and absolutely controlled within limits found for the portal vein of the cat. The volume of flow through the liver can be held constant and controlled.

The venous return can be estimated for a given period of time by means of the differential manometer (d.m.). A master curve is prepared by plotting the difference in height (h) between the two manometers when various volumes of perfusate are passing through the system (V) per minute. When V is plotted against $\sqrt{h}$ a linear relation is found between the values 80 cc/min and 250 cc/min for V. An extrapolation of this line intercepts the $\sqrt{h}$ axis at a distance (C) from zero. K is calculated in the formula $V = K(\sqrt{h} - C)$ and is constant between the above limits. Therefore, during an experimental run the differential reading (h) is taken at three levels of (V) venous return and K for this experiment is calculated. When K for a particular experiment differs from K for the master curve described above, h for the experiment is accordingly corrected and the venous return for any particular time can be estimated to within 1 per cent. error from the manometer reading by finding the V value on the straight line, V plotted against $\sqrt{h}$.

The sequence of flow through the apparatus shown below is as follows: blood passes from the reservoir (R) through the lower valve (V) to the pump (P), then through the upper valve (V) to the oxygenator (O) and to the hydrostatic column (H.C.), thence to the liver in the box (CH, closed by a friction lid) by way of the portal vein and leaves the liver by the hepatic vein passing the differential manometer (d.m.) and returns to the reservoir.

Oxygen bubbles through warm water and passes downward through the center of the spiral cylinder, then upward around the outside spirals. Perfusate passes down both the outside and inside spirals. There appears to be no loss of fluid by evaporation and the oxygen level in the perfusate remains reasonably constant in a given experiment, which in itself is indicative of a constant volume. The perfusate always to be preferred is one which most closely approaches the O_2 and CO_2-carrying capacity of whole blood and to which a compatible anticoagulant is added.

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